

# Levee Inspections and Eligibility

## NWS Levee Safety Program

**Seattle District**

23 APRIL 2013

**Charles Ifft, P.E.**

Inspection of Completed  
Works Project Manager



# Agenda

- Background – Why we do them
- Types of Levees
- Eligibility in PL 84-99
- Seattle District Levee Inventory
- Inspection schedule – National Guidance
- Inspection Process
- Vegetation
- Back in the Office
- Report Writing and Finalization



# Levee Safety Program Objectives:

HQ USACE  
Objectives/NW  
S Objectives

- Hold Public Safety Paramount
- Reduced Economic Impacts
- Maximize Cost Effectiveness
- Develop Reliable and Accurate Information
- Build Public Trust and Acceptance



# USACE Levee Safety Roles and Responsibilities

**Qualifications.** The qualifications of the Levee Safety Officers, Special Assistant, and Program Managers are contained in the table below:

	<b>Proposed Positions</b>	<b>Qualifications</b>
HQ	Corps of Engineers Levee Safety Officer	SES **, P.E. with civil engineering background, management abilities, and competency in the areas related to levee system engineering design, construction, or operations.
	Special Assistant for Levee Safety	P.E. with a civil engineering background, management abilities, and competency in the areas related to the design, construction, operation, inspection, or evaluation of levee systems.
	Corps Levee Safety Program Manager	P.E. or P.G. with management abilities and knowledge and experience in the designing, constructing, operating inspecting or evaluating levee systems.
MSC	Levee Safety Officer	SES *, P.E. with a civil engineering background, management abilities, and competency in the areas related to levee system engineering designing, constructing, operating, inspecting, or evaluating levee systems.
	Levee Safety Program Manager	P. E. or P.G. with management abilities and knowledge and experience in the designing, constructing, operating inspecting or evaluating levee systems.
District	Levee Safety Officer	P.E. with a civil engineering background, management abilities, and competency in the areas related to levee system engineering design, construction, or operations.
	Levee Safety Program Manager	P.E. or P.G. with management abilities and knowledge and experience in the designing, constructing, operating inspecting or evaluating levee systems.

JoAnn Walls

Charles Ifft



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# Types of Levees

- Types of Levees:

- ▶ Federal

- Designed and Constructed by the Corps with an O&M manual, Project Cooperation Agreement (PCA), As-Built, and Turn-over letter

- ▶ Non-Federal

- Constructed by locals (land owner, dike district, city, county, etc.)
    - May or may not have design and as-builts
    - Must have local sponsor (public)

- ICW program includes more than just levees

- Lummi Shore, Wynoochee, Placer Creek, Shelton...



# PL 84-99 Program – Seattle District

## Some Background

- Rehabilitation and Inspection Program (RIP) initiated in 1987
- NWS began Initial Eligibility Inspections (IEIs) in 1987
- Prior to this, all levees were eligible for rehabilitation
- Sponsors sent in letters requesting their levee “systems” be included in the program
- Not all levees requested met the requirements
- IEIs did not included a specific level of protection. Only whether or not the levee met the minimum requirement for inclusion
- Non-Federal levee sponsors = 82
- Currently Eligible levees = 168
- 7% Federal, 93% constructed by local interests



# To be eligible in the PL 84-99 Program:

- Federal
  - ▶ Once the project is physically complete and turned over to the sponsor, it is eligible in the program
  - ▶ No Initial Eligibility Inspection (IEI) is required
- Non-Federal
  - ▶ Public sponsor requests IEI and agrees to sponsor levee
  - ▶ Levee is eligible from the time the request letter is received





# Non-Federal Levee Eligibility Criteria

- Items to be evaluated in the IEI :
  - ▶ Public sponsorship
  - ▶ Structurally sound (2:1, 10 ft topwidth)
  - ▶ Level of protection
    - Urban levees: 10 years plus 2 feet freeboard
    - Agricultural: 5 years plus 1 foot freeboard
  - ▶ Adequately maintained





# Why a Sponsor Would Want to be in the Program?

- The benefits of having a levee that is eligible in the PL 84-99 program include:
  - Cost sharing of repair
    - Non-Federal System - 80% Federal - 20% local
    - Federally Authorized System - 100% Federal
  - An eligible levee will improve the chances of passing a certification analysis for the FEMA Flood Insurance accreditation (100-year flood)
  - The Corps will provide a permanent repair that has been fully consulted on and all appropriate permits obtained
  - Public confidence that the levee is well maintained



# Three Types of Inspections

**Initial Eligibility Inspection (or IEI)** is the first inspection for a levee to be admitted into the PL 84-99 program. This inspection is initiated at the request of a public sponsor .

**Routine Inspection (or CEI)** is a visual inspection to verify and rate levee system operation and maintenance. It is typically conducted each year for all levees in the USACE Levee Safety Program. This is a Condition Survey of the levee, not a performance evaluation. The inspection does not contain rated items for environmental impact.

**Periodic Inspection** is a comprehensive inspection conducted by a USACE multidisciplinary team that includes the levee sponsor and is led by a professional engineer. USACE typically conducts this inspection every five years on the federally authorized levees in the USACE Levee Safety Program. Periodic Inspections include three key steps:

- ▶ Data collection: A review of existing data on operation and maintenance, previous inspections, emergency action plans and flood fighting records
- ▶ Field inspection: Similar to the visual inspection for a Routine Inspection, but with additional features
- ▶ Final report development: A report including the data collected, field inspection findings, an evaluation of any changes in design criteria from the time the levee was constructed, and additional recommendations as warranted, such as areas that need further evaluation.



# The Purpose of a CEI is to evaluate Levee Condition and Communicate Risk

- Levee Owners Manual - March 2006:  
Maintaining Active Status – Continuing Eligibility Inspections (CEIs) To maintain an Active status in the RIP, you're required to provide ongoing maintenance of the project. The Corps monitors this ongoing maintenance through Continuing Eligibility Inspections (CEIs), which are conducted at least every other year, though many Corps districts have elected to hold them on a more frequent basis in order to ensure compliance with the requirements of the RIP.
- CEIs are Conditional Inspections, Not Performance Inspections



# Required Inspection Intervals

<b>INSPECTION INTERVALS FOR FLOOD DAMAGE REDUCTION PROJECTS</b>			
<b>Current Land Use in the Protected Area*</b>	<b>Project Design Event</b>	<b>Interval of Inspection**</b>	<b>Type of Inspection</b>
<b>Urban/Rural/Agricultural <sup>1</sup></b>	<b>100 year event or greater</b>	<b>Annual</b>	<b>Routine</b>
		<b>5 yr</b>	<b>Periodic Inspection<sup>2</sup></b>
		<b>TBD<sup>3</sup></b>	<b>Risk Assessment<sup>4</sup></b>
<b>Urban/Rural</b>	<b>50 to 99 year event</b>	<b>Annual</b>	<b>Routine</b>
		<b>5 yr</b>	<b>Periodic Inspection<sup>2</sup></b>
		<b>TBD<sup>3</sup></b>	<b>Risk Assessment<sup>4</sup></b>
<b>Urban/Rural</b>	<b>10 to 49 year event</b>	<b>2 year</b>	<b>Routine</b>
<b>Agricultural</b>	<b>5 to 99 year event</b>	<b>2 year</b>	<b>Routine</b>
<p>* For combined urban, rural, and agricultural levee systems the higher standard governs.</p> <p>** Consider more frequent interval for levee with water on it all of the time.</p> <p>1. This applies to high consequence agricultural regions.</p> <p>2. Federal projects only.</p> <p>3. 1<sup>st</sup> round of risk assessments will be centrally funded by HQ, but the districts will have to program per HQ direction.</p> <p>4. Risk Assessment for non-Federal projects <b>only if directed and funded by Congress</b>; Initial Risk Assessment for the Federal projects will be budgeted by Corps.</p>			

# Overall Inspection Process

1. Schedule Levee Inspection (as far in advance as possible)
2. Assemble Team (H&H, Civil, EM as appropriate)
3. Have Sponsor perform maintenance if needed prior to date
4. Check inspection database and verify project in LIT
5. Review last inspection and notes or letters
6. Conduct Field Visit
7. Write report and have it QC/QA'd
8. Update NLD and NWS databases
9. Write transmittal letter
10. Route letter and once signed place hardcopy in folder and e-copy on LAN



# Pre-Field Visit Tasks

- Schedule Levee Inspection (as far in advance as possible)
- Assemble Team
- Pick a date for field visit
- Coordinate inspection date with Sponsor
- Have Sponsor perform maintenance if needed prior to date
- Check inspection database and load LIT (instructions for loading a project are located on the P: drive)
- Review last inspection and notes or letters
- Coordinate logistics with sponsor as to where and when to meet
- Get a vehicle from motor pool and any necessary field gear (i.e. – tape, level, paint, stakes, flagging...etc)



# NWS LAN Structure

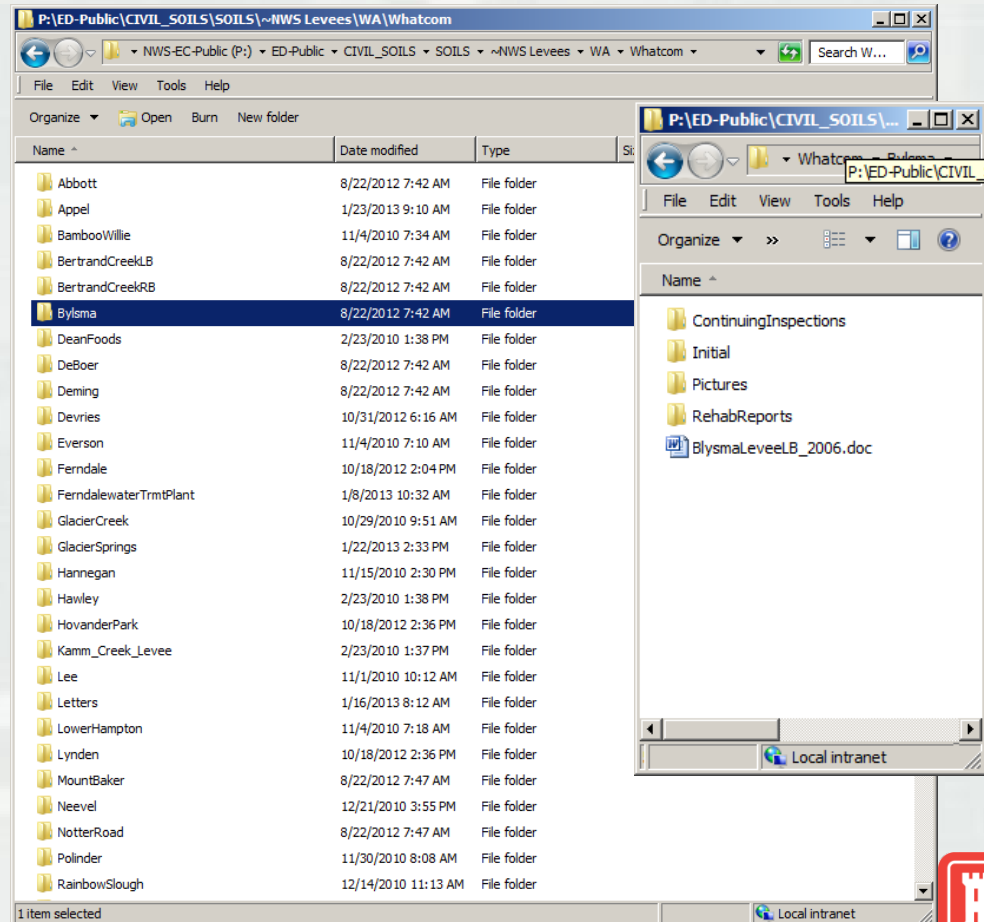
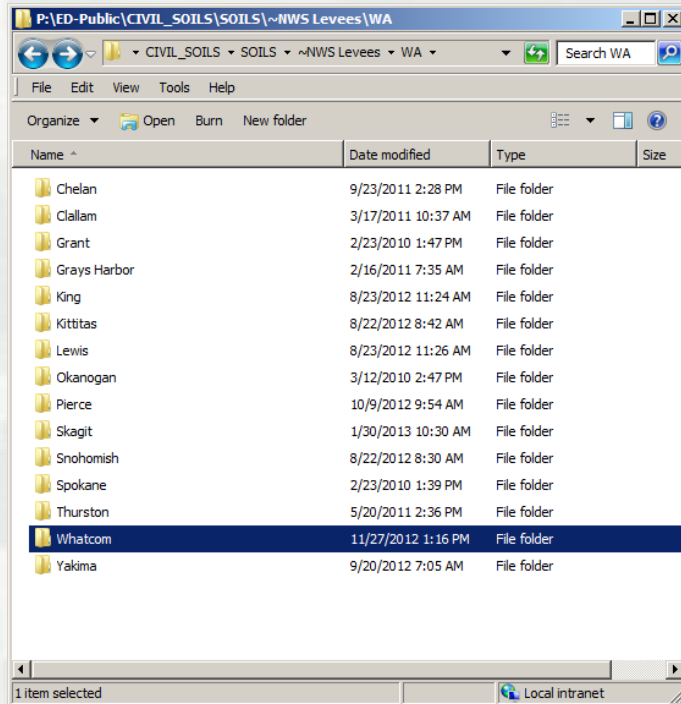
- There are three locations for storing information about NWS levees locally:
  - ▶ The main repository of data about any levee in the District should be stored on the P: drive here:  
P:\ED-Public\CIVIL\_SOILS\SOILS\~NWS Levees
  - ▶ Each State folder has the corresponding county folders and then each levee has it's own folder within the county folder.
  - ▶ The levee folders contain at least three folders: "Continuing Inspections", "Initial", and "RehabReports". They can also include other folders such as "Pictures", "Periodic Inspections", or "Studies".
  - ▶ Each County folder also contains a "Letters" folder for correspondence storage. Since letters can reference more than one levee, this was the best way to track those letters.
  - ▶ We also have to keep the National Levee Database up to date. It is located here: P:\ED-Public\CIVIL\_SOILS\SOILS\NLD
  - ▶ Currently the NWS database resides here: T:\proj\OD\EM\FCW





# NWS LAN Structure

- P: drive directory structure



# NWS LAN Structure

- NWS database “NWS\_levees.mdb” is stored on the “T:” drive
- The .mxd file for ArcGIS includes scripts that run some cool reports that the NLD can’t match at the moment, which is why we maintain two databases.
- Access to the drive is limited since extraneous files will interfere with the scripts. Only store reports and letters here. The script for the database will find all files here and add them to a table in the .mdb database.
- File name must have the last seven digits a the date in the form of “APR2012” for example.
- We are working on porting the scripts to the NLD so that the NWS database will no longer be needed.



# NWS Database

Example report from NWS database.

Can run reports sorted by State, River, Floodbasin, or Sponsor. Can also do error checks such as Eligible levees that are rated "U" and Ineligible levees rated "A", or levees that haven't been inspected for over 5 years.

All Levees\_by\_Sponsor.pdf - Adobe Acrobat Pro

File Edit View Document Comments Forms Tools Advanced Window Help

Create Combine Secure Sign Forms Multimedia Comment

1 / 15 78.7% Find

### NWS Levee Database Export Summary

All Levees - Sorted by Sponsor

Total Levees:	315
Eligible Levees:	168
InEligible Levees:	147
Status Miles	
eligible	224
ineligible	199
Total Miles	422

#### City of Aberdeen

Eligible Levees: 1 Ineligible Levees: 0 Total Levees: 1 Total Levee Miles: 4.3

Project Name	State	River	Length	Status	Rating	Last inspection
Aberdeen, WA	WA	Chehalis River	4.3	eligible	M	APR2010

#### City of Bonners Ferry

Eligible Levees: 2 Ineligible Levees: 0 Total Levees: 2 Total Levee Miles: 2.6

Project Name	State	River	Length	Status	Rating	Last inspection
Bonners Ferry LB	ID	Kootenai River	1.5	eligible	U	APR2011
Bonners Ferry RB	ID	Kootenai River	1.1	eligible	M	APR2011

#### City of Cashmere

Eligible Levees: 2 Ineligible Levees: 1 Total Levees: 3 Total Levee Miles: 1.1

Project Name	State	River	Length	Status	Rating	Last inspection
Cashmere Seg 2	WA	Wenatchee River	0.3	eligible	M	SEP2011
Cashmere Seg1	WA	Wenatchee River	0.1	eligible	M	SEP2011
Cashmere Sewage Treatm	WA	Wenatchee River	0.6	ineligible	U	SEP2011

#### City of Centralia

Eligible Levees: 1 Ineligible Levees: 0 Total Levees: 1 Total Levee Miles: 0.8

Project Name	State	River	Length	Status	Rating	Last inspection
Skookumchuck	WA	Skookumchuck River	0.8	eligible	M	OCT2009

#### City of Coeur D'Alene

Eligible Levees: 1 Ineligible Levees: 0 Total Levees: 1 Total Levee Miles: 1.2

Project Name	State	River	Length	Status	Rating	Last inspection
Coeur D'Alene, ID	ID	Spokane River	1.2	eligible	M	APR2010

#### City of Ellensburg

Eligible Levees: 2 Ineligible Levees: 0 Total Levees: 2 Total Levee Miles: 1.4

Project Name	State	River	Length	Status	Rating	Last inspection
Park	WA	Yakima River	0.6	eligible	M	MAY2012
Reecer Creek	WA	Yakima River	0.7	eligible	M	MAY2012

Tuesday, January 08, 2013 \* - Initial Inspection Report Only Page 1 of 15



# Inspection Field Visit

- Conduct Inspection with Sponsor (if possible)
- Come prepared to answer questions for Sponsor about recent Corps initiatives and policy changes that may affect eligibility
- Give technical advice about how to make the levee the highest functioning facility it can be
- Get pictures and names of people there
- Document any modifications and maintenance conducted by the sponsor since the last inspection
- Ask sponsor about planned maintenance, possible changes or future plans for the project
- Get data points for the various locations along the project. Not all points have to be for deficiencies.



# What to Inspect?

- Checklist has tabs for each of these: Levees, Floodwalls, Interior Drainage, Pump Stations, and Channels
- Most of our projects are levees only but may contain some elements of interior drainage
- Riprap on the river bank can be considered part of the levee and rated in the levee section of the inspection



# What features comprise a levee?

## Appurtenant Structures:

1. Must be man made
2. Must be integral to the functioning of the levee
3. Must be maintained by the sponsor as part of the facility

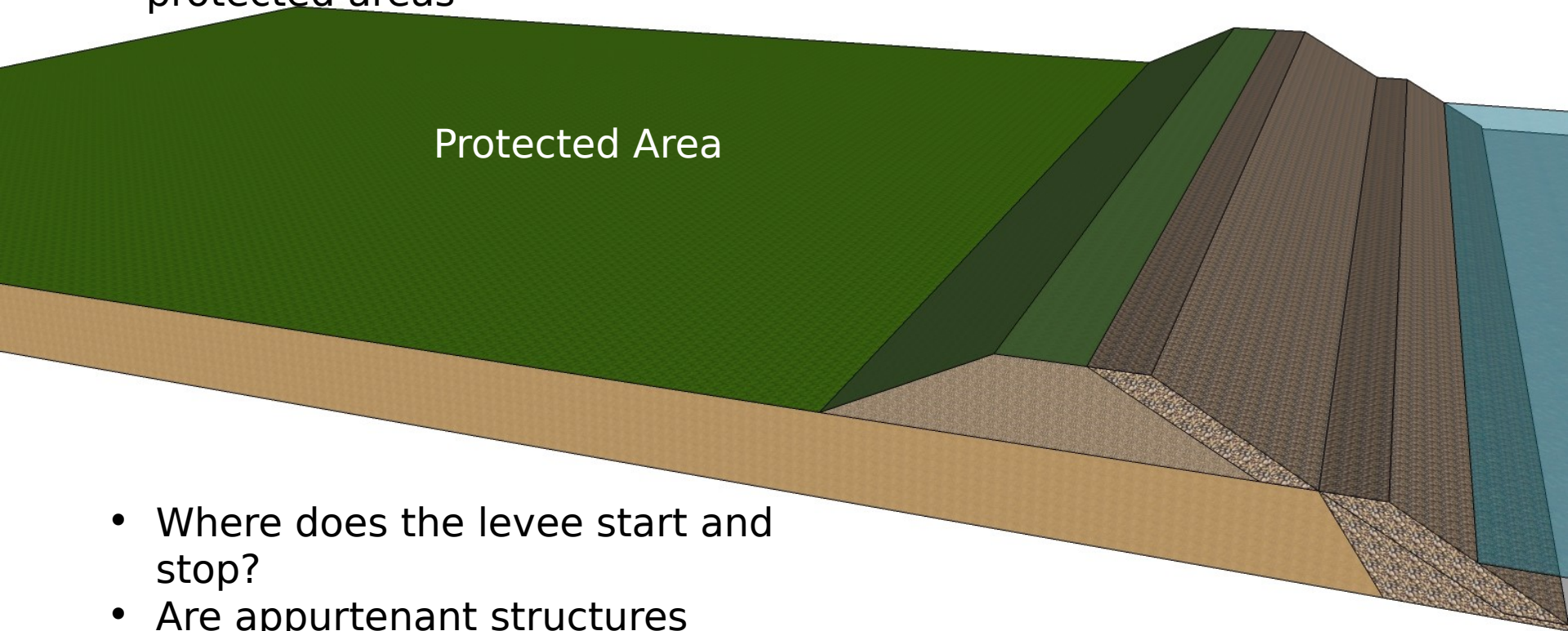




# What features comprise a levee?

Levee System – Ties high ground to high ground. Unique protected area

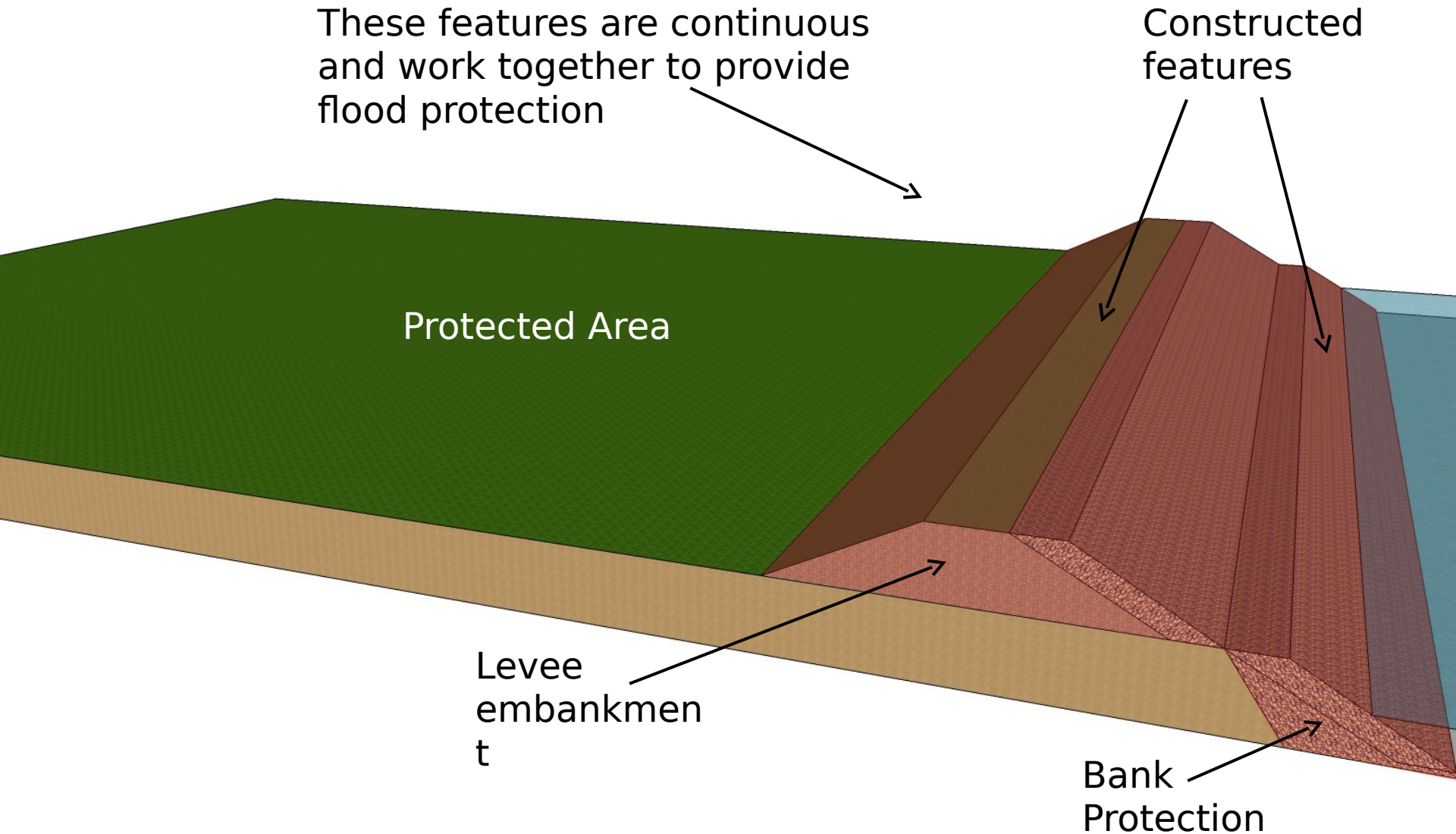
Levee Segment – A piece of a system that is differentiated by multiple sponsors and overlapping protected areas



- Where does the levee start and stop?
- Are appurtenant structures necessary for the levee to function as a flood control structure?

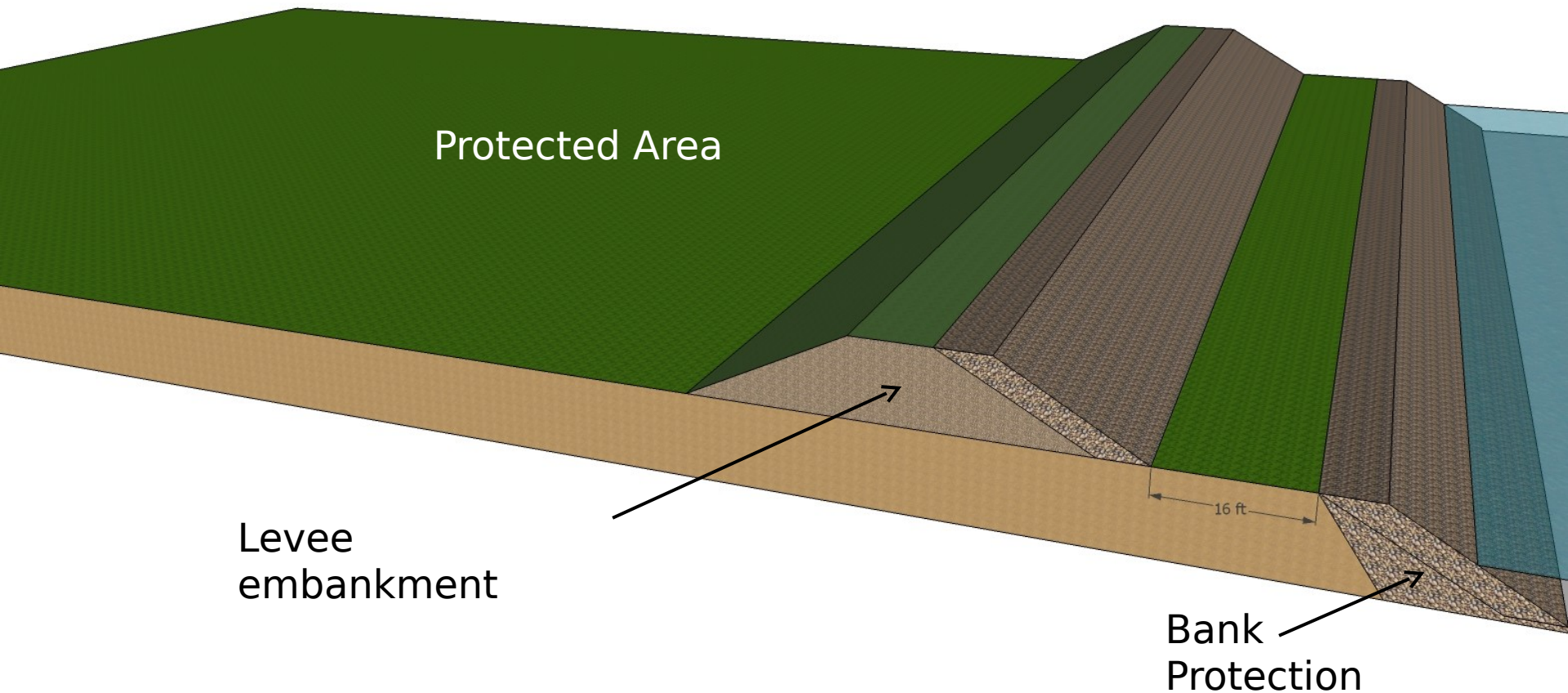


# What to inspect

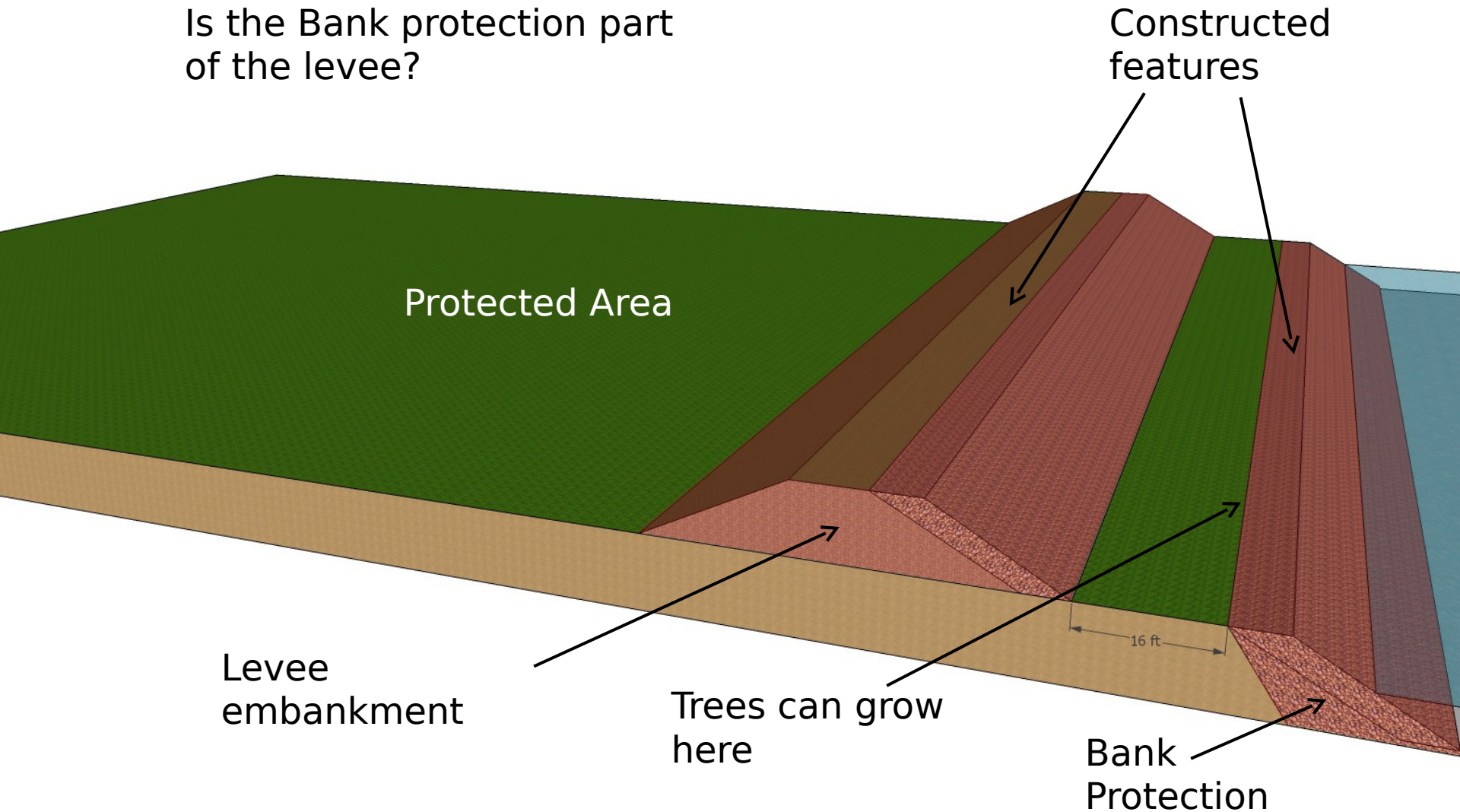


# What to inspect

Is the bank protection integral to the functioning of the levee?

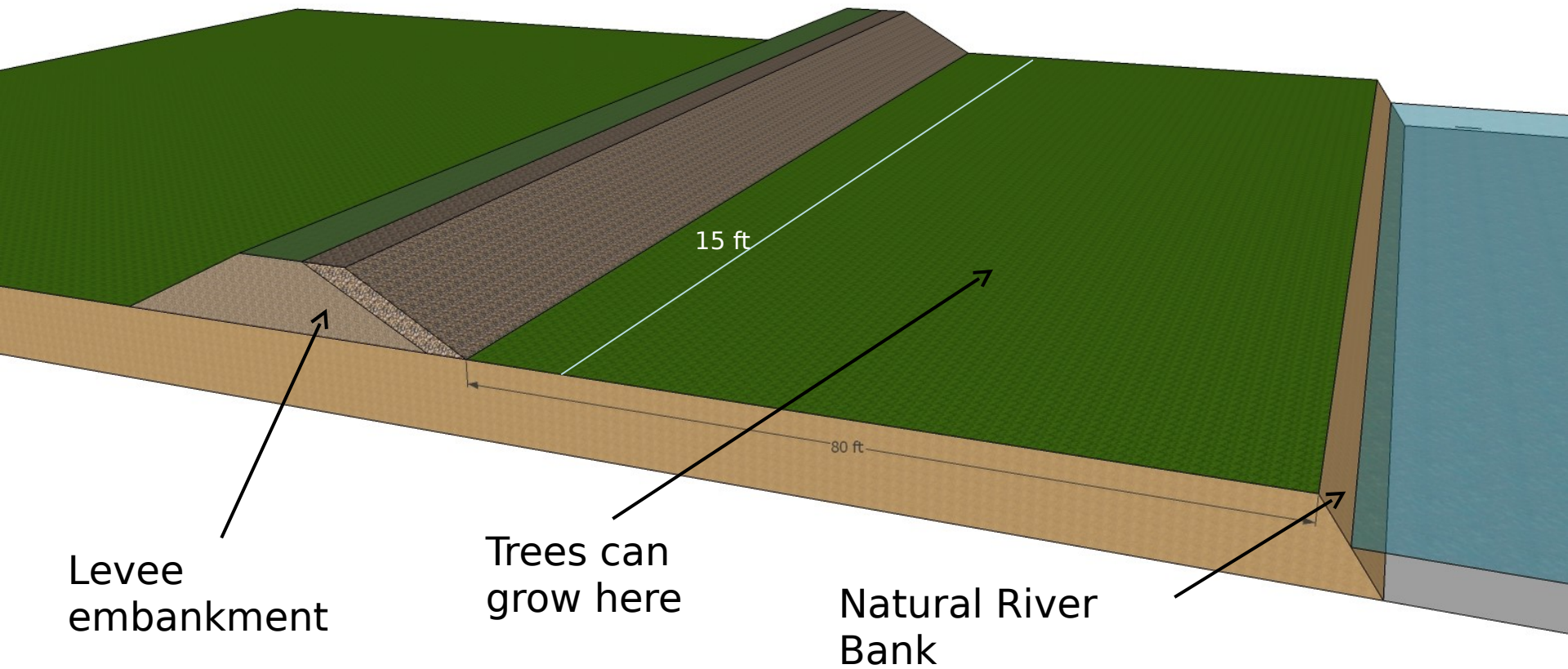


# What to inspect



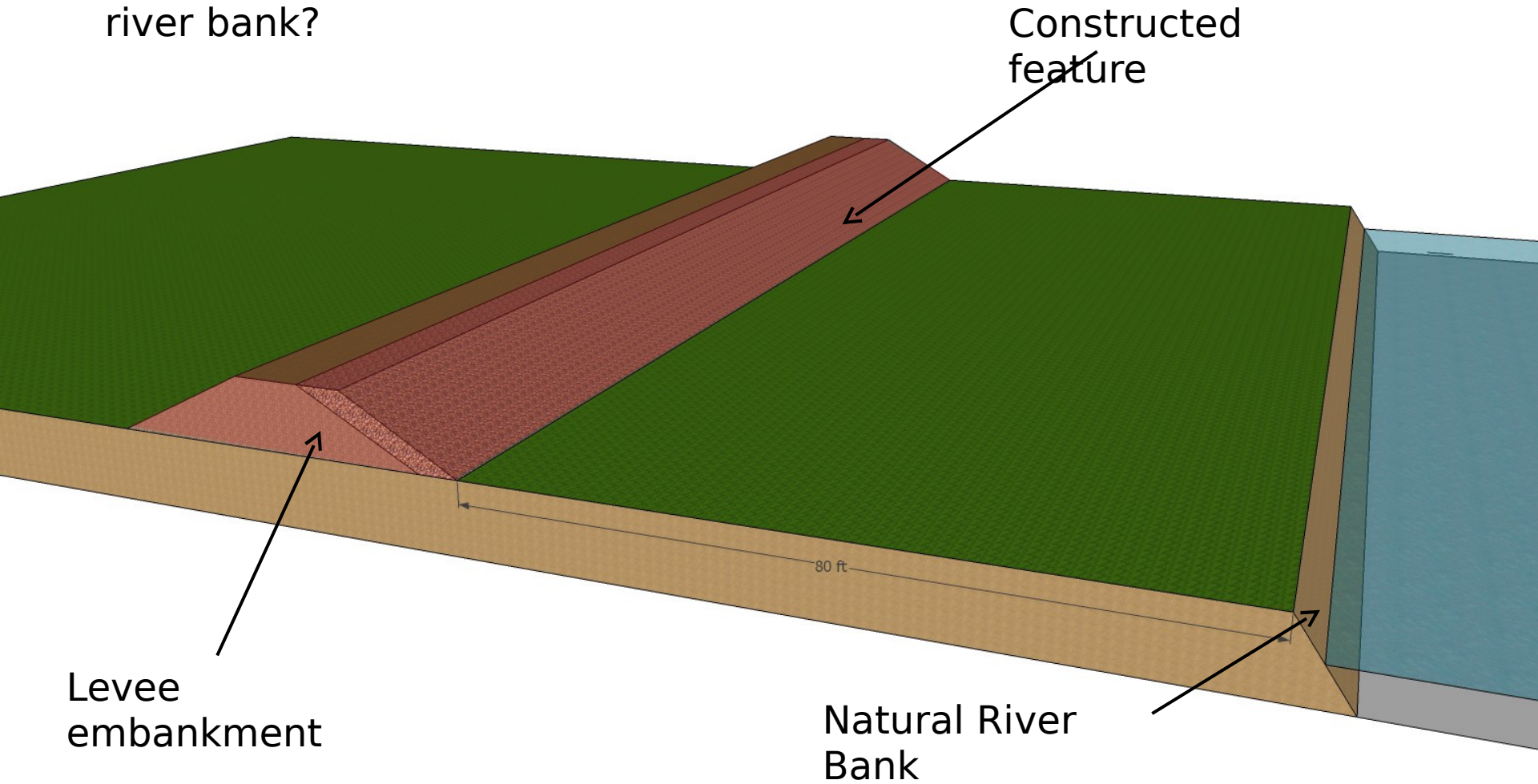


# What to inspect



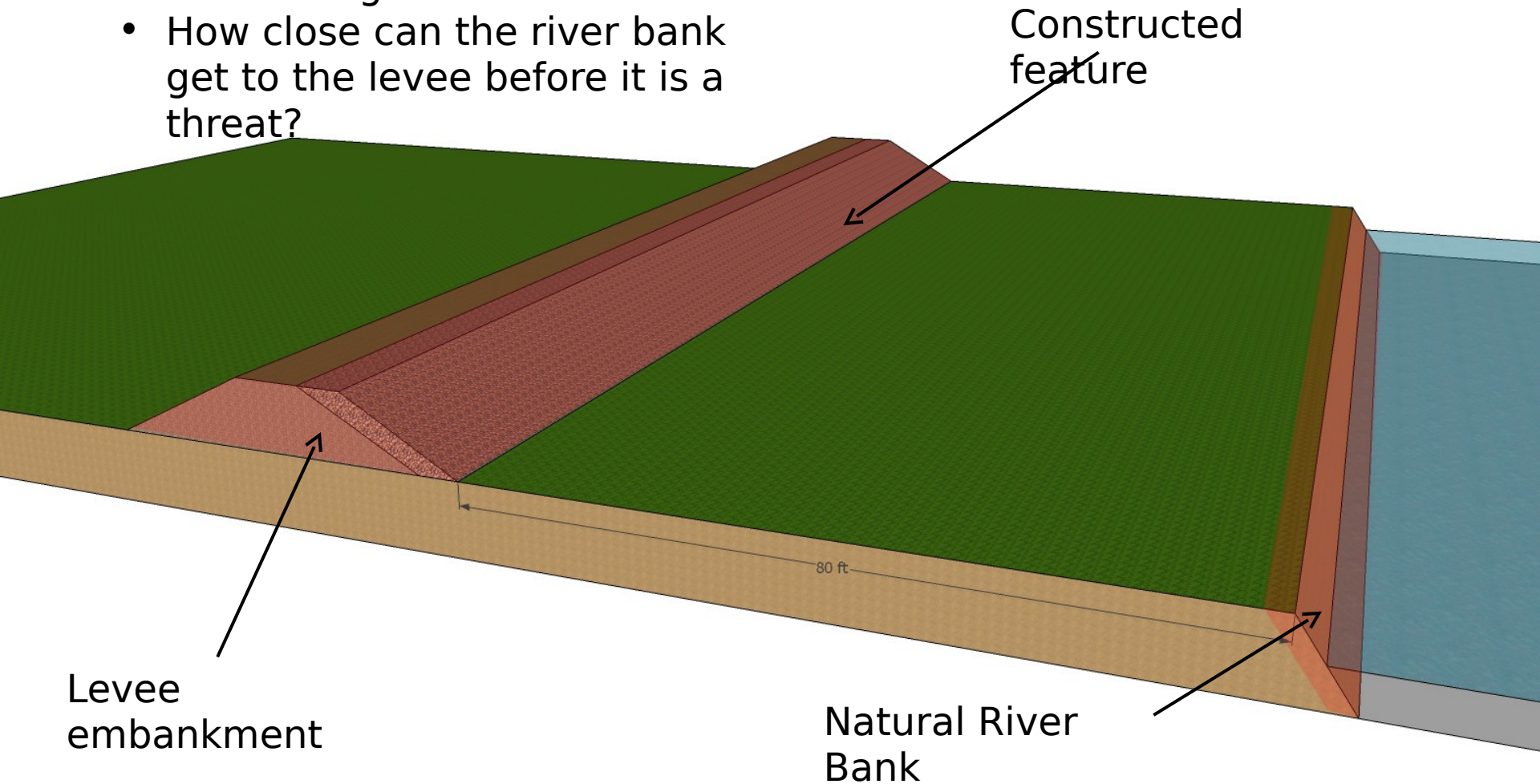
# What to inspect

Is there any need to inspect the river bank?



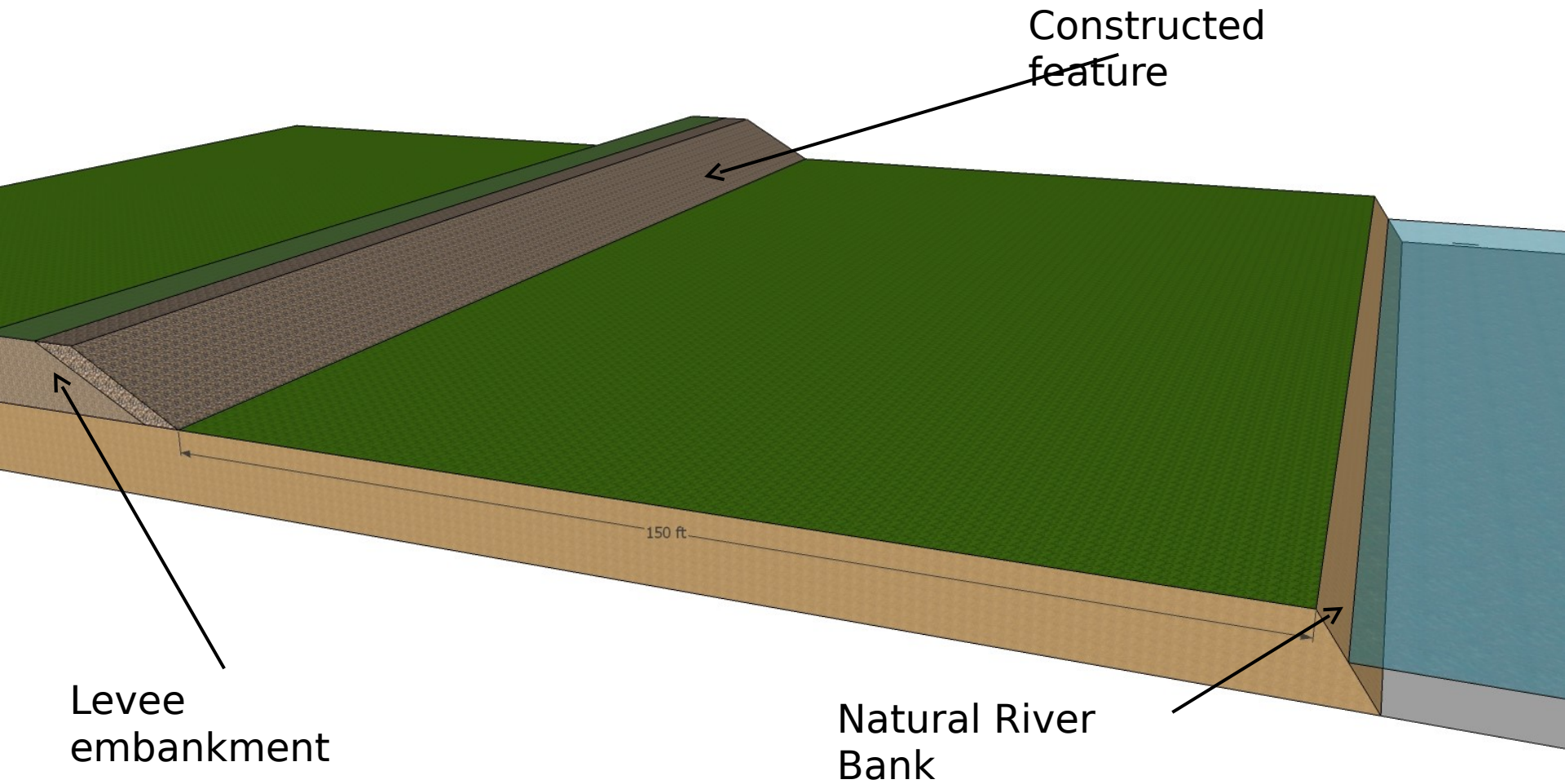
# What to inspect

- Is the river bank integral to the functioning of the levee?
- How close can the river bank get to the levee before it is a threat?





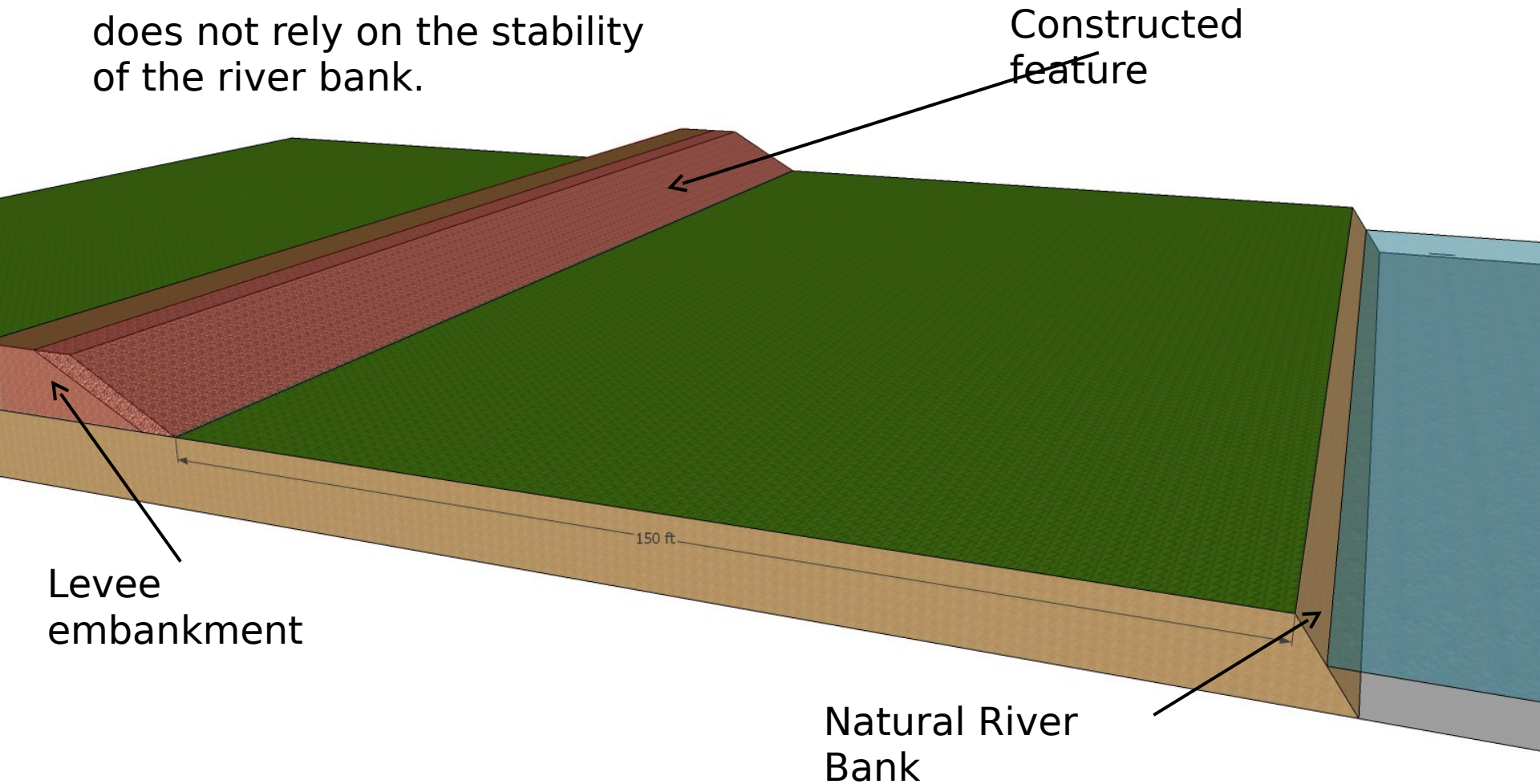
# What to inspect





# What to inspect

At some distance the levee is a stand alone feature and does not rely on the stability of the river bank.



# Levee Vegetation....

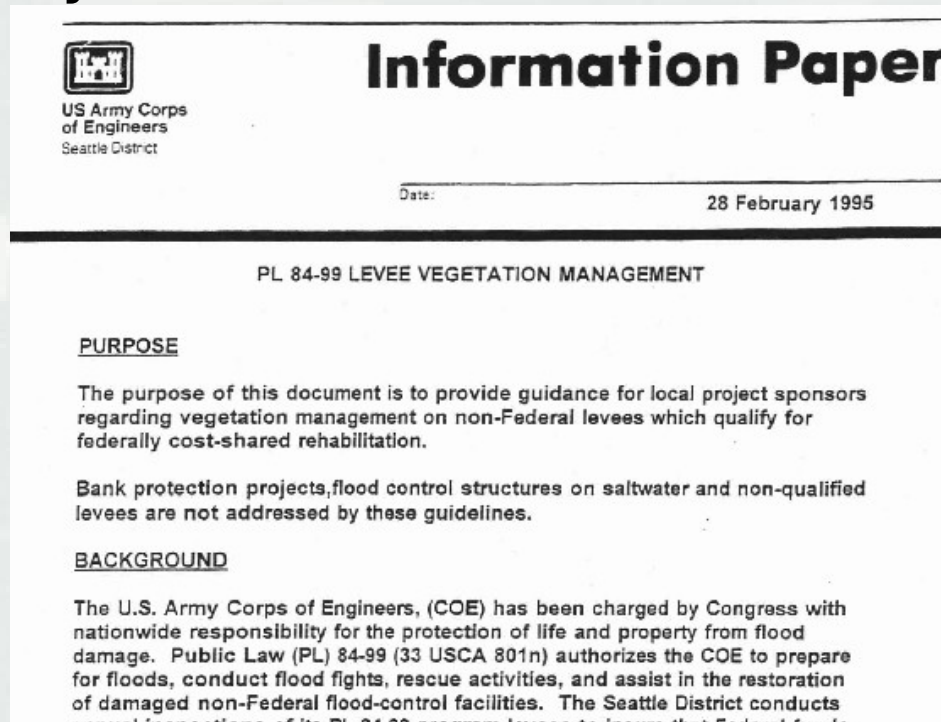


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# Regional Vegetation Variance

- This Variance standard developed in 1995 is what we use to conduct CEI's in Seattle District.
- The NWS "Variance" may sunset sometime in the next few years.



# NWS Levee Vegetation Background

- Riparian vegetation is reported to be important for fish habitat
- The National standard has not changed
- Seattle District pushed for a regional variance (in 1995) in order to use Engineering judgment in developing vegetation maintenance recommendations.
- We are no longer going to inspect to the 1995 variance standards
- NMFS continues to have concerns with our maintenance recommendations and tries to give engineering advice
- If a tree is determined to be a threat to levee integrity, it will remain so regardless of the impacts to the environment caused by it's removal



# The Sponsor Dilemma

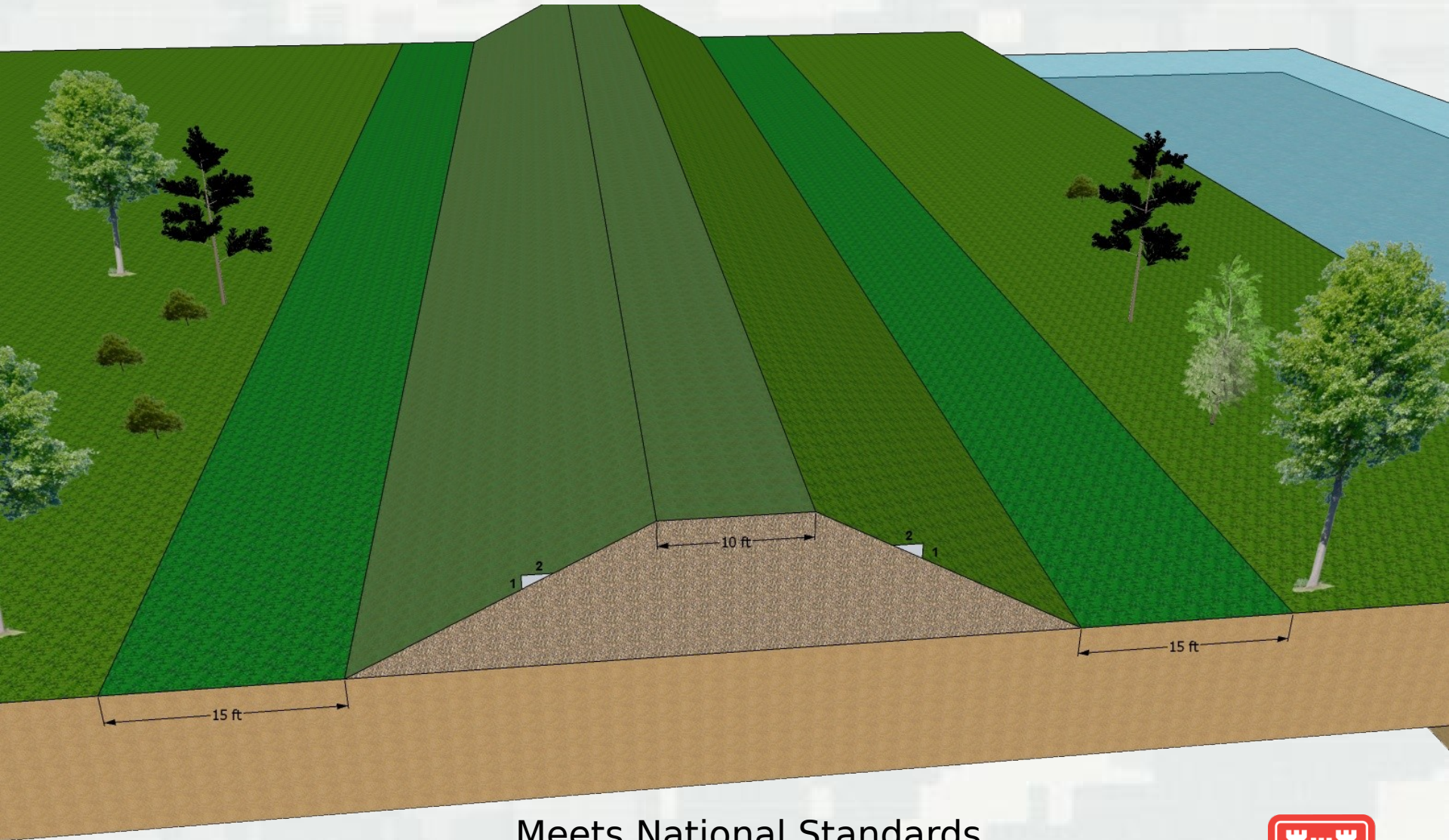
The larger the vegetation becomes adjacent to a river (and levee) the more perceived benefit there is to salmon, and the more danger to levee safety.

## The “Box”:





# Vegetation – National Standard



Meets National Standards  
ETL 1110-2-571. "A" Rating.



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# Vegetation – National Standard



Additional Fill to flatten slope moved the vegetation free zone farther from levee and trees that were ok are now in the vegetation free zone



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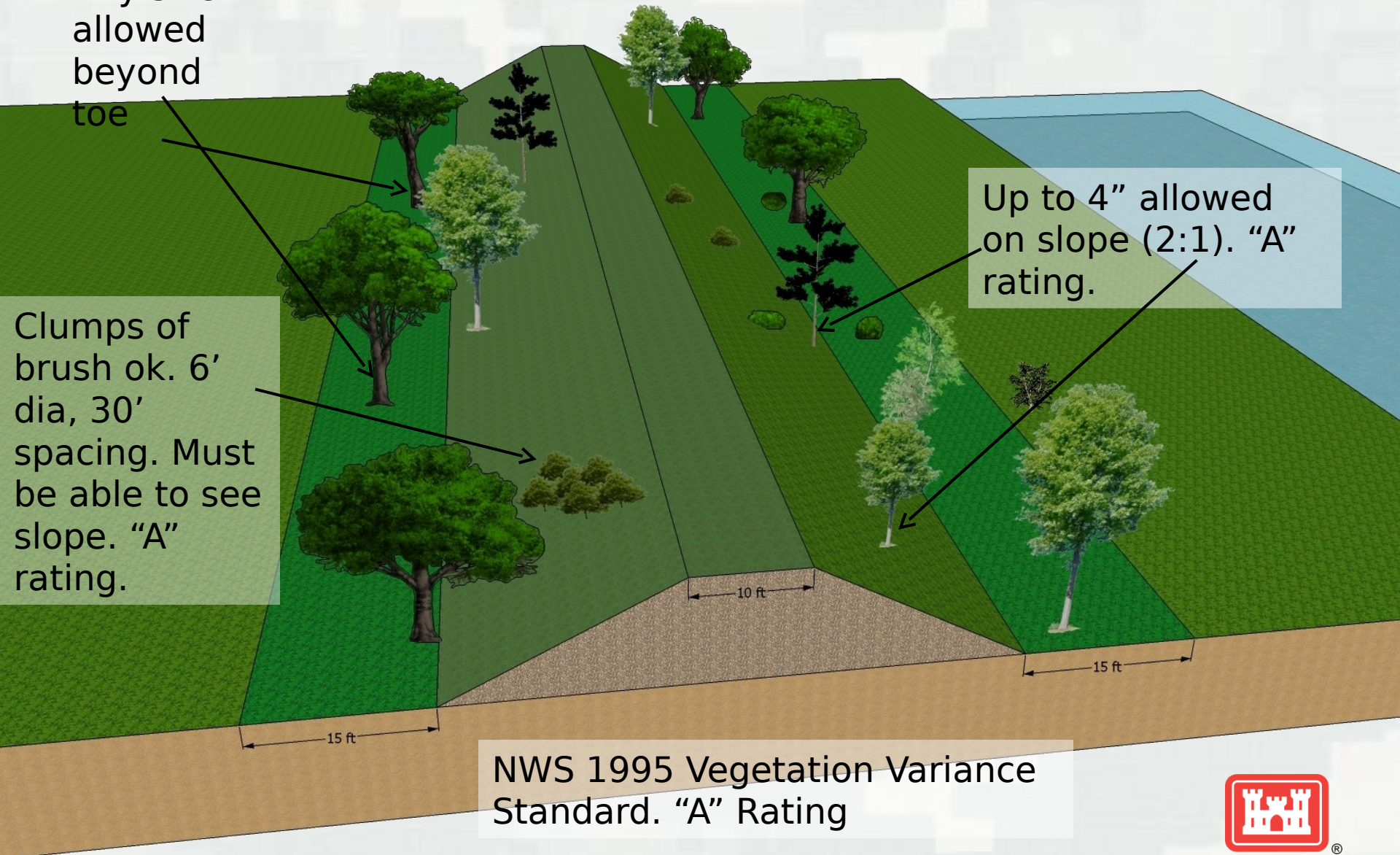


# NWS Vegetation

Any size  
allowed  
beyond  
toe

Up to 4" allowed  
on slope (2:1). "A"  
rating.

Clumps of  
brush ok. 6'  
dia, 30'  
spacing. Must  
be able to see  
slope. "A"  
rating.



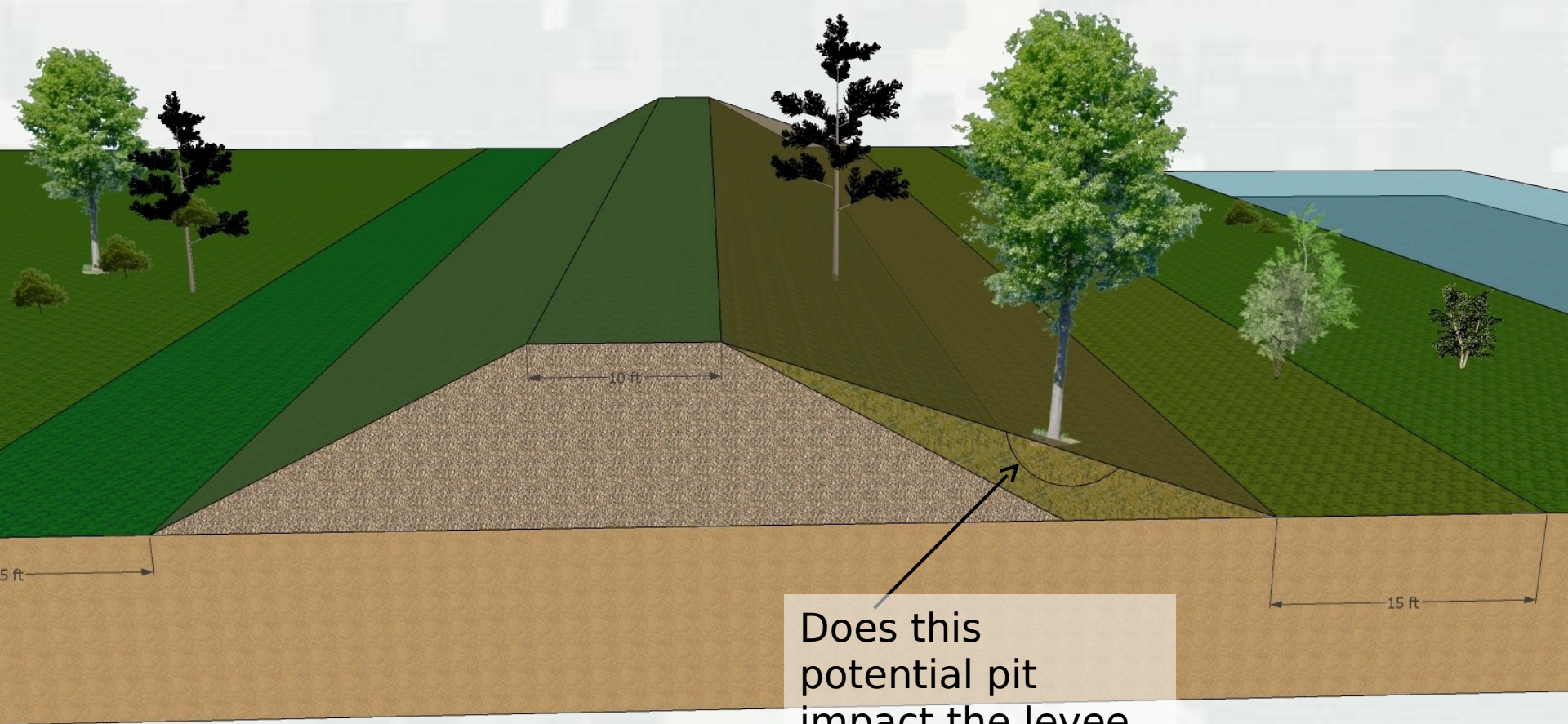
NWS 1995 Vegetation Variance  
Standard. "A" Rating



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# Vegetation



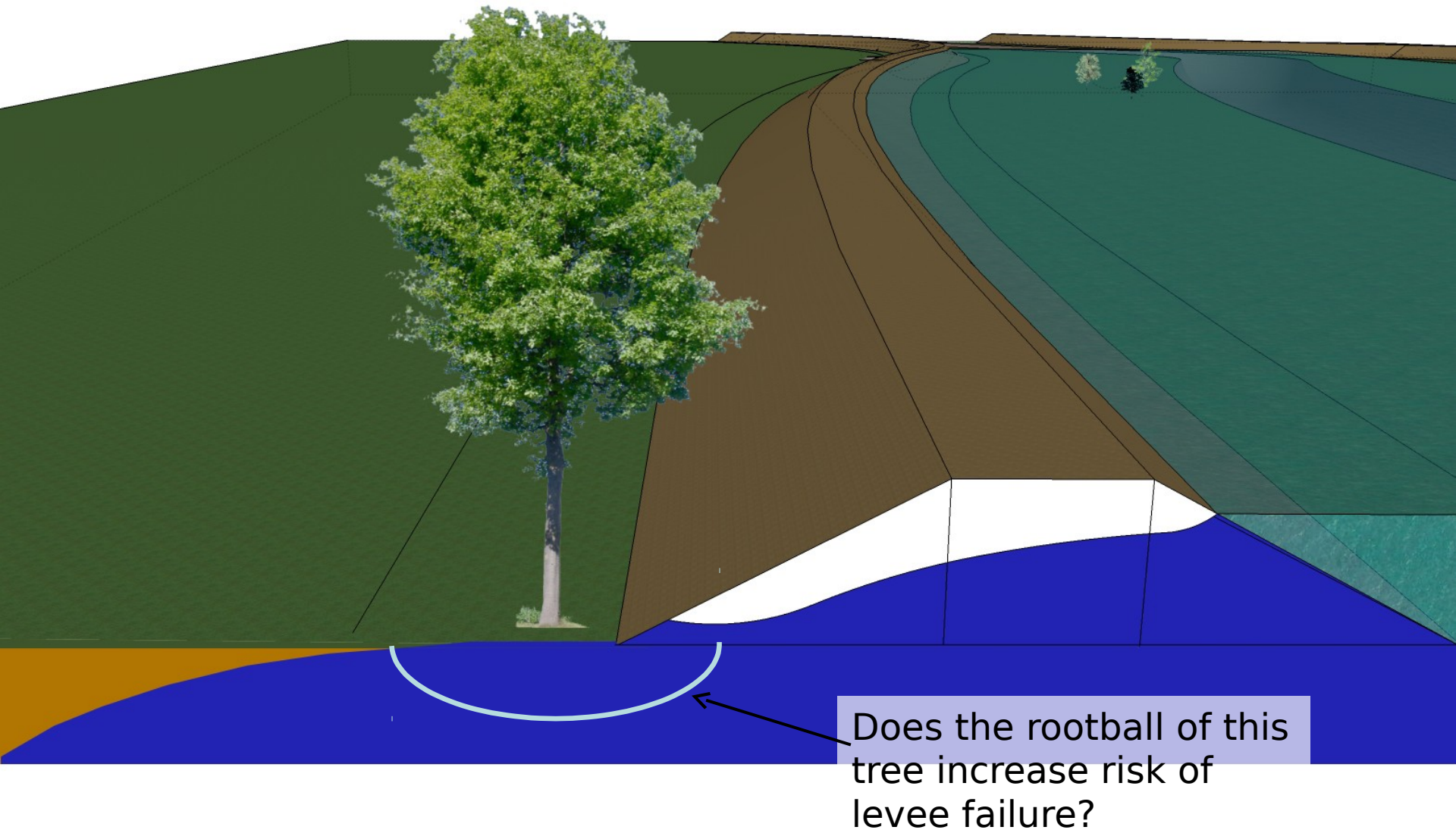
Impacts to levee  
performance

Does this  
potential pit  
impact the levee  
function?



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# Vegetation - Seepage



# Back in the Office

- If an item is rated “U”, an engineering evaluation will be performed to determine if the functioning of the levee will be adversely affected. A system rating of “M” may still be given if the impacts are small.
- Summarize item ratings and determine an overall Segment rating.
- Summarize segment ratings into an overall system rating.
- Prepare a report for each segment. If more than one segment/system, compile them into an overall system report.





# Writing the Report

This is the front page of all reports.



US Army Corps  
of Engineers®

## FOR OFFICIAL USE ONLY Flood Damage Reduction System Inspection Report

Name of System: Lee	
Public Sponsor(s): Whatcom County	
Public Sponsor Representative: Christina Schoenfelder	
Sponsor Phone: (360)676-6876	
Sponsor Email:	
Corps of Engineers Inspectors: Charles Ifft, Jeff Tribbett, Jason Villarreal	Date of Inspection: 26 Oct 2010
Inspection Report Prepared By: Jason Villarreal	Date Report Prepared: 1 Nov 2010
Internal Technical Review (for Periodic Inspections) By: Charles Ifft, P.E.	Date of ITR: 1 Nov 2010
Final Approval By: Dennis Fischer, P.E.	Date Approved: 15 Nov 10
Type of Inspection: <input type="checkbox"/> Initial Eligibility Inspection <input checked="" type="checkbox"/> Continuing Eligibility Inspection (Routine) <input type="checkbox"/> Continuing Eligibility Inspection (Periodic)	Overall System Rating: <input checked="" type="checkbox"/> Acceptable <input type="checkbox"/> Minimally Acceptable <input type="checkbox"/> Unacceptable
Contents of this Report: <input type="checkbox"/> Instructions <input type="checkbox"/> Initial Eligibility Inspection <input checked="" type="checkbox"/> General Items for All Flood Control Works <input checked="" type="checkbox"/> Levee Embankments <input type="checkbox"/> Concrete Floodwalls <input type="checkbox"/> Sheet Pile and Concrete I-walls <input type="checkbox"/> Interior Drainage System <input type="checkbox"/> Pump Stations <input type="checkbox"/> FDR system Channels	Note: This inspection rating represents the Corps evaluation of operations and maintenance of the flood damage reduction system and may be used in conjunction with other information for a levee certification determination for National Flood Insurance Program (NFIP) purposes if applicable. An Acceptable Corps inspection rating, alone, does not equate to a certifiable levee for the NFIP. It is recommended for levee systems currently accredited by the Federal Emergency Management Agency (FEMA) for NFIP purposes receiving a Corps Minimally Acceptable or Unacceptable rating be evaluated by the levee owner to determine the potential impacts to the certification for FEMA.

Report  
Writer  
Signature

ITR and  
Approval  
Signatures



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# Eligibility Determination and Communication

- General sponsor notification process:
  - ▶ **verbally informed of inspection system rating after each inspection. Specific deficiencies should be discussed in the field with the sponsor at the time of the inspection.**
  - ▶ **final report is transmitted to the sponsor within 30 days of the field inspection (sometimes).**
- If levee is rated minimally acceptable, sponsor is provided 2 years (from the date of the inspection transmittal letter) to correct the deficiencies
- If overall levee rating is unacceptable (based on the interim guidance), we notify the sponsor in writing that levee will be ineligible for rehab assistance. The date the letter is signed (by the Col) is the date the levee becomes ineligible.
- If maintenance is immediately completed (generally within 30 days) final letter may be delayed for re-inspection to occur.



# References

EM 1110-2-1913, Design and Construction of Levees, April 30,  
2000ER 1110-2-100

EM 1110-2-2902, Conduits, Culverts, and Pipes, March 31, 1998

ER 1110-2-100, Periodic Inspection and Continuing Evaluation of  
Completed Civil Works Structures

Engineer Technical Letter (ETL) 1110-2-569, Design Guidance for  
Levee Underseepage, May 1, 2005

ETL 1110-2-571, Guidelines for Landscape Planting and Vegetation  
Management at Levees,

33 CFR 208.10

Sec 2 of FCA of 1937

Sec 205 of FCA 1948

PL 84-99

ER 1165-2-119

ER 500-1-1





# Questions?



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